UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,369	05/15/2006	Noboru Ichinose	PKHF-04053US	9867

21254 7590 11/18/2009

MCGINN INTELLECTUAL PROPERTY LAW GROUP, PLLC
8321 OLD COURTHOUSE ROAD
SUITE 200
VIENNA, VA 22182-3817

EXAMINER	
SALERNO, SARAH KATE	
ART UNIT	**PAPER NUMBER**
2814	
MAIL DATE	**DELIVERY MODE**
11/18/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/567,369	ICHINOSE ET AL.	
	Examiner	Art Unit	
	SARAH K. SALERNO	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,6,9-13,15 and 21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,6,9-13,15 and 21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on09/15/09 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 4, 6, 9-13, 15 and 21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 and 6 contain the limitation “a second layer comprising an oxidation gallium containing nitrogen”. The specification and drawings do not describe a second layer “comprising an oxidation gallium containing nitrogen” but does describe a second layer made of GaN and other GaN compounds containing In or Al but not oxygen (page

4 lines 7-11, page 5 lines 19 and page 8 lines 1-10). Examiner understands that as part of the nitriding process an intermediate layer will from between the Ga_2O_3 substrate first layer and the second layer of GaN. This intermediate layer is not clearly discussed in the specification as being the second layer or any other layer of the device in applicant's invention.

Claim 21 contains the limitation "a second layer comprising a Ga_2O_3 which contains nitrogen. As stated for claims 1 and 6, The specification and drawings do not describe a second layer comprising a Ga_2O_3 which contains nitrogen (page 4 lines 7-11, page 5 lines 19 and page 8 lines 1-10).

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1, 4, 6, 9-13, 15 and 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 and 6 contain the limitation "a second layer comprising an oxidation gallium containing nitrogen". First, the phrase "oxidation gallium" is unclear. The examiner believes that the term "oxidation" should read "oxidized" if the process by which the gallium has been treated is what is trying to be claimed. If the claim is referring to Ga_2O_3 then the claim should read " gallium oxide". Second, the claim is unclear because as described above the second layer in the disclosure does not

contain oxygen and appears to be claiming an intermediate layer that forms as part of the nitriding process while the oxygen is being replace by nitrogen (see "Preparation and structural properties for GaN films grown on Si (111) by annealing" by Yang et al. (IDS reference 02/07/06)). This intermediate layer is not part of the resultant second layer structure of GaN as disclosed in applicant's instant application. Claims 1 and 6 will therefore be interpreted as a second layer comprising GaN without oxygen as supported by the disclosure.

Claim 21 contains the limitation " a second layer comprising a Ga_2O_3 which contains nitrogen". As discussed above for claims 1 and 6, the meaning and properties of the second layer claimed in claim 21 are unclear and will be interpreted in the same manner as claims 1 and 6.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1,2 and 4-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Ichinose et al. (US PGPub 2004/0007708)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim 1: Ichinose teaches a semiconductor layer, comprising:

a first layer (1) comprising a Ga_2O_3 system single crystal substrate; and

a second layer (1a) comprising an oxidation gallium containing nitrogen (Fig. 7; [0082-0085]).

It is noted that Ichinose uses the same nitriding process as described in the instant specification and therefore would inherently form an intermediate layer of GaN containing O until the process is completed or all of the O of the substrate is replaced with N.

Claim 4: Ichinose teaches the first layer comprises Ga_2O_3, $(In_xGa_{l-x})_2O_3$ where 0 ≤ x < I, $(Al_xGa_{l-x})_2O_3$ where 0 ≤ x < I, $(In_xAl_yGa_{1-x-y})_2O_3$ where 0 ≤ x < I, 0 ≤ y < I, and 0 ≤ x + y <I, or the like, as a main constituent [0038-0096].

Claim 6: Ichinose teaches a semiconductor layer, comprising:

a first layer comprising a Ga_2O_3 system semiconductor;

a second layer comprising an oxidation gallium containing nitrogen; and

a third layer comprising a GaN system epitaxial layer and formed on the second layer [0038-0096].

It is noted that Ichinose uses the same nitriding process as described in the instant specification and therefore would inherently form an intermediate layer of GaN containing O until the process is completed or all of the O of the substrate is replaced with N.

Claim 9: Ichinose teaches the first layer consists of a single crystal β- Ga_2O_3.

Claim 10: Ichinose teaches the single crystal β - Ga_2O_3 has a prismatic shape having a square in cross section, and its axis direction matches a-axis 100> orientation, b-axis 010> orientation or c-axis 001> orientation [0038-0096].

Claim 11: Ichinose teaches the first layer comprises (InxGal-x)$_2O_3$ where 0 < x <1 [0038-0096].

Claim 12: Ichinose teaches the first layer comprises (AlxGal-x)$_2O_3$ where 0 < x <1 [0038-0096].

Claim 13: Ichinose teaches the first layer comprises (InxAlyGa1-x-y)$_2O_3$ where 0 < x < 1, 0 < y 1<, and 0< x + y <1 [0038-0096].

Claim 15: Ichinose teaches the first layer consists of single crystal β - Ga_2O_3 [0038-0096].

Claim 21: Ichinose teaches a semiconductor layer, comprising:

a first layer comprising a Ga_2O_3 system single crystal substrate; and

a second layer comprising a Ga_2O_3 which contains nitrogen, wherein the second layer comprising a GaN system compound semiconductor [0038-0096].

It is noted that Ichinose uses the same nitriding process as described in the instant specification and therefore would inherently form an intermediate layer of GaN containing O until the process is completed or all of the O of the substrate is replaced with N.

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 2, 4-6, 8, 14, 19 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh et al. (US Patent 6,218,207).

Claim 1: Itoh teaches a semiconductor layer, comprising:

a first layer (22) comprising a Ga_2O_3 system single crystal substrate; and

a second layer (22a) comprising an oxidation gallium containing nitrogen (FIG. 2A-2C; Col. 5-7).

Claim 4: Itoh teaches the first layer comprises Ga_2O_3, $(In_xGa_{l-x})_2O_3$ where $0 \leq x < l$, $(Al_xGa_{l-x})_2O_3$ where $0 \leq x < l$, $(In_xAl_yGa_{1-x-y})_2O_3$ where $0 \leq x < l$, $0 \leq y < l$, and $0 \leq x + y < l$, or the like, as a main constituent (FIG. 2A-2C; Col. 5-7).

Claim 6: Itoh teaches a semiconductor layer, comprising:

a first layer (22) comprising a Ga_2O_3 system semiconductor;

a second layer (22a) comprising an oxidation gallium containing nitrogen; and

a third layer (25) comprising a GaN system epitaxial layer and formed on the second layer (FIG. 2A-2C; Col. 5-7).

Claim 21: Itoh teaches a semiconductor layer, comprising:

a first layer (22) comprising a Ga203 system single crystal substrate; and

a second layer (22a) comprising a Ga_2O_3 which contains nitrogen, wherein the second layer comprises a GaN system compound semiconductor (FIG. 2A-2C; Col. 5-7).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 9, 10, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. (US Patent 6,218,207) as applied to claim 1 above, and further in view of Ota et al. (US PGPub 2003/0107098).

Regarding claim 9, as described above, Itoh substantially reads on the invention as claimed, except Itoh does not teach the first layer consists of a single crystal β-Ga_2O_3. Ota teaches the first layer consists of a single crystal β- Ga_2O_3in a light emitting device because of its stability [0029-0030, 0042]. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the first layer taught by Itoh to be β- Ga_2O_3 because of its stability as taught by Ota [0029-0030, 0042].

Claim 10: Ota teaches the single crystal β - Ga203 has a prismatic shape having a square in cross section, and its axis direction matches a-axis 100> orientation, b-axis 010> orientation or c-axis 001> orientation [0029-0030, 0042].

Claim 12: Ota teaches the first layer comprises (AlxGal-x) $_2O_3$ where 0 <x <1 [0029-0030, 0042].

Claim 15: Ota teaches the first layer consists of single crystal β -Ga203 [0029-0030, 0042].

12. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. (US Patent 6,218,207) in view of Braddock (US Patent 6,989,556).

Regarding claims 11 and 13, as described above, Itoh substantially reads on the invention as claimed, except Itoh does not teach the first layer comprises (InxGal-x) $_2O_3$where 0 < x < 1. (InxGa1-x) $_2O_3$. Braddock teaches (InxGal-x) $_2O_3$where 0 < x < 1 as a well known Group III-V compound used in light emitting devices (Col. 4). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.,* 325 U.S. 327, 65 USPQ 297 (1945). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted β - Ga_2O_3 with (InxGal-x) $_2O_3$where 0 < x < 1 because of its known use in light emitting devices as taught by Braddock (Col. 4)

Response to Arguments

13. Applicant's arguments with respect to claims 1, 4, 6, 9-13, 15 and 21 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to whose telephone number is (571)270-1266. The examiner can normally be reached on M-R 8:00-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Wael M Fahmy/
Supervisory Patent Examiner, Art Unit 2814

/S. K. S./
Examiner, Art Unit 2814